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CONTENTS

Page

ROBINSON, F. A.—The Effect on Honey Bees of Parathion Sprays Applied to Florida Citrus Groves 51

JOHNSON, ROGER B., and C. R. STEARNS, JR.—Effect of Rain on Control of Purple Scale with Parathion 57

TAMBURO, S. E., and F. GRAY BUTCHER—Biological Studies of the Florida Dusky Wing Skipper, and a Preliminary Survey of Other Insects on Barbados Cherry 65

HOOD, J. DOUGLAS—*Frankliniella welaka*, a New Thrips from Florida 71

SABROSKY, CURTIS W.—The Taxonomic Status of the Armyworm Parasite Known as *Archytas piliventris* (Van der Wulp) (Diptera: Larvaevoridae) 77

PEPPER, J. O., and A. N. TISSOT—A New Species of *Cinara* from Pennsylvania (Homoptera: Aphidae) 85

Notes 89

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THE EFFECT ON HONEY BEES OF PARATHION SPRAYS APPLIED TO FLORIDA CITRUS GROVES [1]

F. A. ROBINSON [2]

In the last four or five years, the use of parathion has increased tremendously, especially for the control of scale insects in Florida citrus groves. When this material was first released for commercial use, there were numerous popular and scientific articles published concerning the toxic and residual properties of parathion. One of these articles [3] mentioned tests where caged honey bees were killed in one to eight hours when placed above a cage which had been sprayed with one percent parathion spray twelve days previously. After reading or hearing about some of these articles, many of the beekeepers in Florida formed exaggerated ideas about the toxic effects of parathion. One beekeeper, in particular had somehow gotten the idea that a single parathion spray application would kill any living thing in a citrus grove and remain effective for six months or more.

Since honey produced from various citrus sources accounts for more than 50 percent of the honey production in Florida, beekeepers became understandably concerned as to the effects the use of parathion sprays in citrus groves would have on the honey-producing industry. There was some fear expressed that beekeeping might have to be abandoned in areas where parathion was used widely. Early in the spring of 1950, reports were received telling of beekeepers who had had colonies of bees killed by parathion, or had heard of other beekeepers whose bees had been killed. These reports were generally very difficult to trace to the original source and in most cases it was impossible to determine whether these losses were due to parathion or to some other cause. As the use of parathion in citrus groves was becoming so widespread, it was important that controlled tests be made to determine just what effect parathion sprays have on honey bees under actual field conditions. To obtain this information, tests were conducted in

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[1] Contribution of the Department of Entomology. Florida Agricultural Experiment Station Journal Series, No. 362.

[2] Assistant Apiculturist, Florida Agricultural Experiment Station, Gainesville, Florida.

[3] Eckert, J. E. 1948. Toxicity of some of the newer chemicals to honey bees. J. Econ. Ent. 41: 487-491.

the summer of 1950 and spring of 1951 at Lake Alfred, Florida, in cooperation with Dr. J. T. Griffiths, Entomologist at the Citrus Experiment Station. The bees used in these tests were furnished by Mr. George O'Neil of Haines City, Florida.

The first test was made in July 1950, in an eight-acre grapefruit grove which was sprayed with two pounds of 15 percent wettable parathion in 100 gallons of water. This spray was applied at the rate of 35 gallons per tree.

In the first test, two lots of 3-frame nuclei were used. One lot, consisting of six nuclei, was placed in the center of the grove before the spraying operation began. These nuclei were located so as to receive a heavy application of the spray material as the Speed Sprayer passed. The nuclei were inspected two hours after they were sprayed and very little injury was detected. The maximum number of dead bees that could be found in any nucleus was about fifty. Bees in the nuclei behaved normally, and flight, which had ceased during the spray application, was beginning again. The queens in the nuclei were laying normally and no effects on the brood were observed. Three more observations were made at eight hour intervals. At the end of that time, two nuclei each had about 150 dead bees, and the others from 30 to 50. The death rate of the bees in these nuclei was surprisingly low—in fact, with the exception of the two "nukes" which had 150 dead bees, the death rate was very little higher than that of normal colonies which had not been exposed to any insecticidal sprays. Activity and behavior of the bees remained normal in all respects.

The second lot, consisting of ten 3-frame nuclei, was placed in the grove four hours after spraying was completed. Observations were made on these nuclei for 36 hours. At the end of this time, only five to ten dead bees were found in front or inside of any nucleus. The behavior of the bees and queens appeared perfectly normal and no ill effect on the brood was detected.

As the first test was conducted at a time when the citrus trees were not in bloom, a second test was made in March, 1951, at a time when the trees were in bloom and the honey bees actively working in the grove. Since parathion sprays are not normally applied while the trees are in bloom, special arrangements were made by Dr. Griffiths to have a ten-acre grove sprayed on March 14 and again on March 26, 1951. The colonies of bees were placed 30 yards from the north end of

the grove. Two of the colonies were placed on scales and their weights recorded every other day for a four-week period. Observations also were made as to the numbers of dead bees found in front of the hives, activity and behavior of the bees, queen behavior and effects on brood.

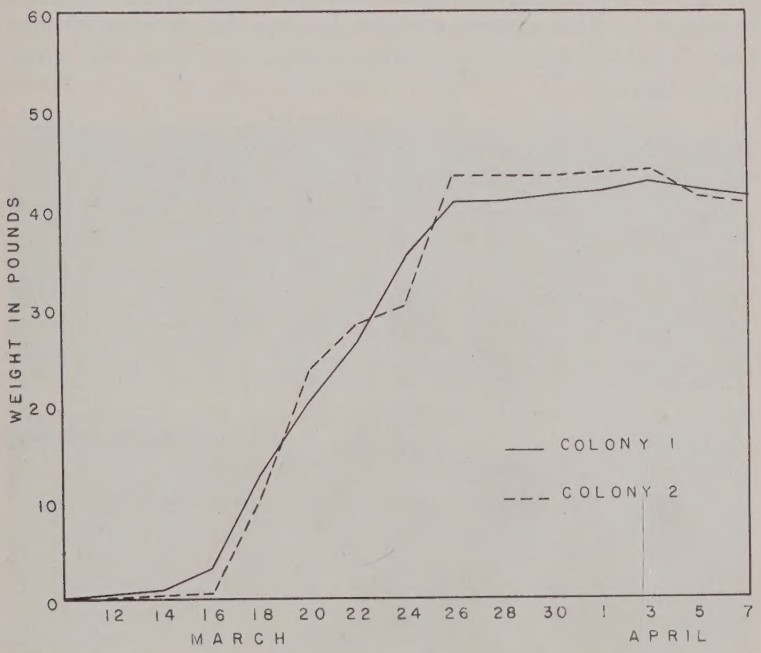
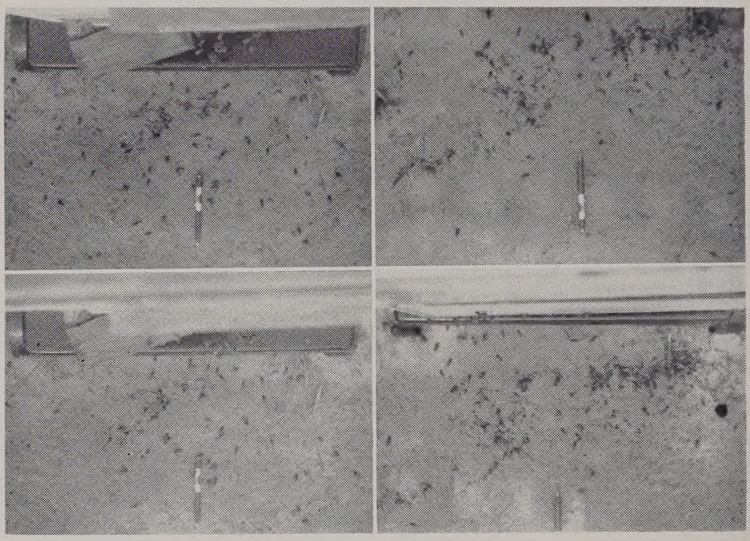


Figure 1.—Daily weight of two colonies of honeybees collecting nectar from a citrus grove sprayed with parathion.

The first spray application was made on March 14, 1951. The rate of application was two pounds of 15 percent wettable parathion in 100 gallons of water. This spray was applied at the rate of 35 gallons per tree. The temperature was about 50° F. when the spraying operation began and no bees were observed visiting the bloom at this time. However, by the time the spraying was completed, large numbers of bees were observed visiting the blooms. The second spray application was made on March 26, 1951, and this time there were bees working in the grove at the time the spraying operation began. The activity of the bees ceased for a period of several hours until the spraying operation had been completed and

spray residue had dried on the trees. Most of the blooms had already dropped from the trees and the nectar flow was about over when the second application was made, and this was undoubtedly the reason why little or no increase in weight was recorded after March 26. A graph showing the weights of these two colonies from March 12 through April 10 is shown in figure 1. Observations were made as to the number of dead bees found in front of the hives before and after the spray applications.



Colony 1 Colony 2

Figure 2.—Photographs of the ground in front of the scale colonies. Upper pictures one day before and lower pictures one day after first spray application.

Photographs were taken of the ground immediately in front of the two scale colonies. In figure 2, the top pictures were taken one day before the first application of parathion, and the bottom pictures were taken one day after the grove was sprayed. After each observation was made the ground in front of the hives was cleared of dead bees and a close examination of these photographs shows little or no difference in the numbers of dead bees before and after the grove was sprayed. After failing to note any increase in death rate of adult bees at the hives, close examinations were made in sev-

eral locations in the grove to determine whether or not the field bees might be dying before they could return to the hives. This idea was abandoned after repeated examinations failed to disclose any larger numbers of dead bees than can be found in any citrus grove during the time the trees are in bloom.

Each colony was checked before the grove was sprayed as to the amounts of brood it had and each was checked again after the sprays had been applied. In no colony was any adverse effect observed on brood production. The queens all continued to lay eggs normally and the percent viability of the eggs remained unchanged. The sealed and unsealed brood matured normally and showed no signs of being affected in any way by parathion residue which might have been brought back to the colony by the field bees.

CONCLUSIONS

The results of these tests indicate that parathion sprays used in citrus groves do not present nearly as great a threat to honey bees as had been expected when this material first came into widespread use. This conclusion seems especially justified when one considers that in these tests the bees were in one case directly exposed to the spray material and in the other case they were working the blooms within three to four hours after the sprays had been applied—and yet even under these conditions there was no detectable adverse effect on the colonies. Unless the colonies of honey bees were in the grove at the time the spray applications were made there seems to be little danger that they would suffer any serious injury.

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EFFECT OF RAIN ON CONTROL OF PURPLE SCALE WITH PARATHION [1]

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Although the fate of spray residues under grove conditions is of importance to citrus growers, little is known about the effect of wind, rain, and sunlight on the efficiency of insecticidal deposits. For example, the application of parathion to citrus trees is often followed, or even interrupted, by rain. It has not been known if removal of the insecticidal deposit by rain reduced control of purple scale, *Lepidosaphes beckii* (Newm.) sufficiently to make respraying advisable.

In 1952, a research program was initiated to obtain information on this problem. As the aim of this research was to determine what reduction in control of purple scale could be expected from rain falling at predetermined intervals after application of parathion, the use of natural rainfall was impractical. Again, the physical characteristics of rainfall could not be duplicated under grove conditions with the equipment available. It was assumed that removal of parathion residues from citrus trees by spraying them with water would be more nearly complete and effect scale control more than would a natural rain falling at the same interval after the application of the spray. Therefore, an attempt was made to wash all parathion from sprayed trees, with the idea that if such removal of residues did not reduce scale control, neither would reduction of residues by natural rain.

All trees in three experiments were sprayed with 1.7 pounds of 15 percent parathion wettable powder and 5.0 pounds of wettable sulfur per 100 gallons of spray, except for one set of plots in Experiments II and III. These were sprayed with 5.0 pounds of wettable sulfur per 100 gallons of spray, the parathion being omitted. Wettable sulfur was used in all sprays for the control of rust mite, *Phyllocoptruta oleivora* (Ashm.). The interval between the application of parathion sprays and the removal of toxic residues by washing the trees with water was recorded for each plot. Plots sprayed with parathion but not washed were used as the standard or check. Washing was

[1] Florida Agricultural Experiment Station Journal Series, No. 374.

accomplished with hand spray guns and an hydraulic sprayer operated at approximately 500 pounds pressure per square inch at the pump. Two guns were operated simultaneously. Fifty gallons of water were used to wash each tree. To wash trees, the operator walked slowly around each tree while applying the water from top to bottom as a fine spray. Usually at least three trips had to be made around each tree to apply the desired volume of water.

Parathion residues on samples of leaves collected immediately after the spray application and again after each wash were determined by the method of Averell and Norris (1948).

Estimates of purple-scale populations were obtained through counts made a few days before sprays were applied and again about one month after treatment. Such population estimates were used to calculate percentages of reduction in purple-scale populations. Percentages of reduction were then converted to equivalent angles (Snedecor, 1946) for analysis of variance in Experiments II and III.

Population estimates were also used to calculate "Corrected Relative Infestations after Sprays" using a formula developed by Ebeling (1947). The latter value does not show the absolute magnitude of the scale insect infestations, but shows the relative magnitudes of the populations corrected for differences that existed before treatment. A parathion spray not removed by washing was used as the standard at 100 and all other treatments were compared with it.

EXPERIMENT I

A block of large Valencia orange trees at Lake Alfred was divided into plots of four trees each. On June 25, 1952, a parathion spray was applied to all trees with a Speed Sprayer equipped with a volute and drawn through the grove at approximately one mile an hour. About 25 gallons of spray were applied to each tree. Two plots of trees were washed one hour after application and other sets of two plots were similarly washed two, three, four and six hours after application.

Pre-application samples of purple scale were collected June 24, 1952, while post-application samples were collected July 24, 1952. Purple-scale populations were estimated by determining the percentages of leaves infested with live purple scale according to the method of Griffiths and Thompson (1949).

TABLE 1.—PURPLE-SCALE INFESTATIONS AFTER WASHING HIGH INITIAL PARATHION RESIDUES FROM VALENCIA ORANGE TREES AT DIFFERENT INTERVALS AFTER APPLICATION OF PARATHION-SULFUR SPRAYS. LAKE ALFRED, FLORIDA, JUNE-JULY 1952.

Treatment	Interval Before Washing	Parathion Residues After Wash*	Reduction of Parathion Residues**	Percent Leaves Infested		Corrected Relative Post-Spray Infestations
				Pre-Spray	Post-Spray	
Parathion, 15%, 1.7 Lbs. Sulfur, 10 Lbs.	1 hour	0.16	77.8%	18.0%	2.0%	254
Parathion, 15%, 1.7 Lbs. Sulfur, 10 Lbs.	2 hours	0.12	83.3%	23.8%	5.8%	574
Parathion, 15%, 1.7 Lbs. Sulfur, 10 Lbs.	3 hours	0.12	83.3%	17.2%	1.6%	212
Parathion, 15%, 1.7 Lbs. Sulfur, 10 Lbs.	4 hours	0.08	88.9%	14.7%	2.3%	424
Parathion, 15%, 1.7 Lbs. Sulfur, 10 Lbs.	6 hours	0.12	83.3%	13.7%	1.2%	200
Parathion, 15%, 1.7 Lbs. Sulfur, 10 Lbs.	Not Washed	....	....	27.3%	1.2%	100

* Micrograms of Parathion per Square Centimeter of Leaf Surface.
** Based on Initial Deposit of 0.72 Mcg./Cm.^{2}

An initial deposit of 0.72 micrograms of parathion per square centimeter of leaf surface was obtained with the sprays. The percentages of the initial parathion desposit removed by washing were similar, regardless of the time before washing (table 1). There was no correlation between the interval before washing and the corrected relative post-spray infestations of purple scale. Populations were higher wherever parathion residues were reduced by washing than where such residues were not washed, but the difference was not sufficient to justify reapplication of parathion in commercial practice.

EXPERIMENT II

Randomized plots of two trees replicated three times were used for this experiment in a grove of twelve-year-old Valencia orange trees in the vicinity of Lake Alfred.

Pre-application samples of purple scale were collected July 6, 1953, while post-application samples were collected August 10, 1953. Samples of 50 leaves were picked at random from the outer branches around the bottom of each tree. These were placed in plastic bags and kept under refrigeration until the scale insects could be counted. Samples were examined with the aid of a binocular microscope. The total number of live purple scales which could be identified as females or which could not be identified as males were recorded.

TABLE 2.—PURPLE-SCALE INFESTATIONS AFTER WASHING LOW INITIAL PARATHION RESIDUES FROM VALENCIA ORANGE TREES AT DIFFERENT INTERVALS AFTER APPLICATION OF PARATHION-SULFUR SPRAYS. LAKE ALFRED, FLORIDA, JULY-AUGUST 1953.

Treatment	Interval Before Washing	Parathion Residues After Wash*	Reduction of Parathion Residues**	Average No. Live Purple Scale per Leaf		Corrected Relative Post-Spray Infestations
				Pre-Spray	Post-Spray	
Parathion, 15%, 1.7 Lbs. Sulfur, 5.0 Lbs.	1 hour	.020	81.1%	3.63	1.17	181
Parathion, 15%, 1.7 Lbs. Sulfur, 5.0 Lbs.	2 hours	.015	85.8%	3.04	0.94	174
Parathion, 15%, 1.7 Lbs. Sulfur, 5.0 Lbs.	4 hours	.015	85.8%	4.14	1.01	137
Parathion, 15%, 1.7 Lbs. Sulfur, 5.0 Lbs.	Not Washed	....	....	4.16	0.74	100
Sulfur, 5.0 Lbs.	Not Washed	....	....	3.01	2.04	382

* Micrograms of Parathion per Square Centimeter of Leaf Surface.
** Based on Initial Deposit of .106 Mcg./Cm.^{2}

On July 14, 1953, one set of plots was sprayed with wettable sulfur while all other trees were sprayed with sulfur plus parathion. About 15 gallons of spray were applied to each tree. Both sprays were applied with hand spray guns and a hydraulic grove sprayer. A similar sprayer was used to wash the trees.

Data presented in table 2 show that a low initial deposit of 0.106 micrograms of parathion per square centimeter of leaf surface was obtained with the sprays. Percentages of the parathion deposit removed by washing were similar, regardless of

the interval before washing. Corrected relative post-spray infestations were higher where parathion deposits were washed from the trees than where parathion was not removed, but lower than where no parathion had been applied. Furthermore, corrected relative post-spray infestations were inversely correlated with the interval before reduction of parathion by washing. Differences in corrected relative post-spray, purple-scale infestations represented significant differences in purple-scale control. Differences were significant at odds greater than 99 to 1 and only the reduction obtained where trees were washed four hours after application of parathion was not significantly different from that obtained where parathion was not washed from the trees.

EXPERIMENT III

Experiment III was similar to Experiment II except that additional intervals between application and washing of toxic residues were used. Pre-application samples of purple scale were collected October 27, 1953, and post-application samples on December 28, 1953. Sprays were applied October 29, 1953. Approximately 16 gallons of spray were applied to each tree.

Whereas a high initial parathion deposit was obtained in the first experiment and a low initial deposit in the second, an intermediate deposit of 0.407 micrograms per square centimeter of leaf surface was obtained in the third. Parathion deposits were not similar after washing, but were inversely related to the interval between spraying and washing (table 3). These differences in toxic residues after washing, however, had no apparent effect on scale control.

Corrected relative post-spray, purple-scale infestations were higher where parathion was washed from trees than where it was left undisturbed, but these differences were not significant. Populations were significantly higher, at odds greater than 99 to 1, where only sulfur was used than where parathion was used. Control of purple scale with parathion was thus adequate in all cases.

SUMMARY AND CONCLUSIONS

Three experiments were performed to determine indirectly the possible effect of rainfall on the control of purple scale with parathion. Orange trees were sprayed with parathion and then washed with water at various intervals to determine how long

parathion must be present to control purple scale. The extent to which washing removed parathion was determined by analysis of residue samples collected immediately after application of sprays and again after each wash. Purple-scale populations were estimated before application of sprays and again one month later. Such estimates were used to calculate corrected relative post-spray, purple-scale infestations.

TABLE 3.—PURPLE-SCALE INFESTATIONS after WASHING MODERATE INITIAL PARATHION RESIDUES FROM VALENCIA ORANGE TREES AT DIFFERENT INTERVALS after APPLICATION OF PARATHION-SULFUR SPRAYS. LAKE ALFRED, FLORIDA, OCTOBER-DECEMBER 1953.

Treatment	Interval Before Washing	Parathion Residues After Wash*	Reduction of Parathion Residues**	No. Live Purple Scale per Leaf		Corrected Relative Post-Spray Infestations
				Pre-Spray	Post-Spray	
Parathion, 15%, 1.7 Lbs. Sulfur, 5 Lbs.	1 hour	.079	80.6%	1.21	0.21	210
Parathion, 15%, 1.7 Lbs. Sulfur, 5 Lbs.	2 hours	.079	80.6%	1.70	0.24	172
Parathion, 15%, 1.7 Lbs. Sulfur, 5 Lbs.	4 hours	.058	85.7%	1.74	0.27	185
Parathion, 15%, 1.7 Lbs. Sulfur, 5 Lbs.	6 hours	.027	93.4%	1.52	0.41	321
Parathion, 15%, 1.7 Lbs. Sulfur, 5 Lbs.	8 hours	.001	99.8%	1.07	0.24	268
Parathion, 15%, 1.7 Lbs. Sulfur, 5 Lbs.	24 hours	.011	97.3%	1.39	0.18	157
Parathion, 15%, 1.7 Lbs. Sulfur, 5 Lbs.	Not Washed	....	....	1.58	0.13	100
Sulfur, 5.0 Lbs.	Not Washed	....	....	1.47	1.82	1,494

* Micrograms of Parathion per Square Centimeter of Leaf Surface.
** Based on Initial Deposit of .407 Mcg./Cm.^{2}

The outstanding variable among the three experiments was the initial parathion deposit; this varied from the high of 0.72 micrograms per square centimeter of leaf surface in the first test to 0.407 in the third and a low of 0.106 in the second. Where

initial deposits were high or intermediate, removal of parathion within one hour or more after application of sprays had little effect on scale control. Where the initial deposit was low, however, removal of parathion within two hours after application resulted in a significant reduction in control of purple scale. These data indicate that rainfall one or more hours after application of parathion sprays has little effect on scale control where thorough full-coverage sprays are applied.

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BIOLOGICAL STUDIES OF THE FLORIDA DUSKY WING SKIPPER, AND A PRELIMINARY SURVEY OF OTHER INSECTS ON BARBADOS CHERRY

S. E. Tamburo and F. Gray Butcher[1]
University of Miami
Coral Gables, Florida

The Florida dusky wing skipper, *Ephyriades brunnea floridensis* B. and C., was reported feeding on barbados cherry (*Malpighia glabra* L.) by the junior author in 1951. Available literature has not revealed references to the habits or biology of this butterfly, so a study of this insect has been conducted during the summer of 1954.

This insect, described as a distinct subspecies in 1948, is a representative of the subfamily Pyrginae, family Hesperiidae. The adult (Fig. 1) is well illustrated and briefly described by Klots, but no reference to the larval forms (Fig. 2) has been located.

The larvae have been found feeding within webbed leaves in the barbados cherry plantings at the University of Miami Experimental Farm, where they have caused noticeable injury each season. Infestations have not been abundant enough to cause extensive defoliation of the host plants, but many of the individual plants have shown a ragged appearance from the leaf injury. A single caterpillar ties the edges of two or more leaves together by a rhythmic moving of the head, with a silken thread exuding from spinnerets. The larvae feed within this protected area, without destroying it completely but frequently leave it for other feeding localities, with accompanying leaf-tying.

The full grown larvae in natural resting position are from 25 to 30 mm. long. The body is basically green in color from the contained food, with a distinct brown- to black-colored head capsule. There are eight distinct orange-colored spots on the head capsule, and three distinct white longitudinal stripes along each side of the body. The uppermost or dorsal stripe of each side lie close together on the dorsal surface of the body, and coalesce in the last abdominal segment. Between these dorsal stripes, irregular translucent spots are observed.

[1] Student, and Associate Professor and Research Entomologist, respectively.

Life history studies were attempted by collecting immature stages of this insect from field plantings, and rearing them in the laboratory. Individual larvae were maintained in covered glass or plastic dishes with host plant foliage, and also on small potted plants within cheese-cloth cages. In the dishes, food material was replaced at two-day intervals.

Eggs are deposited singly on the surfaces of leaves, stems and fruit of the barbados cherry. The complete egg stage was not observed, since eggs were not obtained from butterflies in captivity. One viable egg collected in the field hatched after five days.

Figure 1.—Adult of Florida Dusky Wing Skipper.

Four larval instars were recognized. The first instar has an almost transparent body until it begins feeding the day after hatching. Then the normal green color of the older larva develops. One first instar larva molted after 18 days, but two other representatives of this instar continued active for 22 and 27 days respectively. One second instar larva required 27 days to reach ecdysis, while another specimen of the 2nd instar continued active for 36 days without a molt. Three third instar

larvae completed their development in 23, 29, and 34 days respectively.

Nine individuals in the fourth instar developed to pupation. Eight of these 9 larvae pupated in from 15 to 23 days, with an average period of 19.4 days. One larva required 38 days in this instar before pupation.

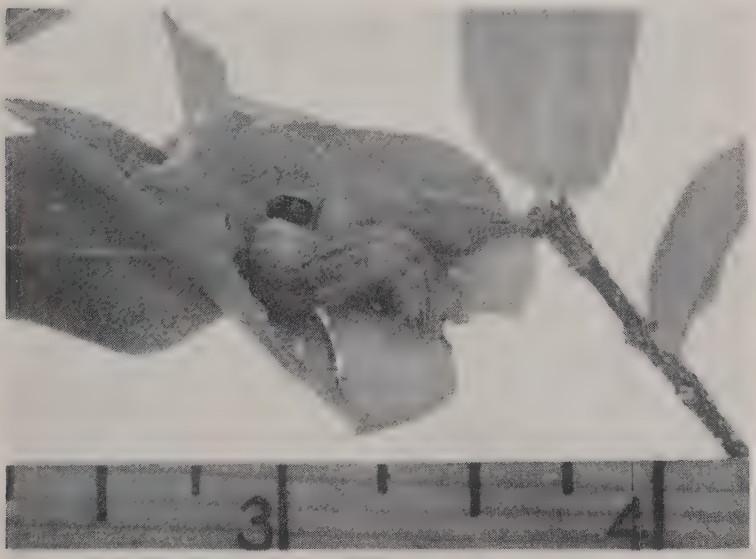

Figure 2.—Larva of Florida Dusky Wing Skipper.

The duration of the pupal stage was observed on nine individual butterflies. Four of these required 7 days, two of them 8 days, one 6 days, one 5 days, and one individual was in the pupal stage 12 days. A pupal period of slightly over one week is thus indicated. The adult butterfly emerges by forcing a neat split in the anterior portion of the pupal case. Differentiation between the male and female individuals could not be made except by examination of the genitalia. In the field, adults were observed feeding on blossoms of barbados cherry and spanish needles (*Bidens Leucantha* L.). In captivity they were maintained alive slightly over one week, feeding on a sugar-water solution.

Larvae of this skipper were not found on any plant except barbados cherry. They were found in various plantings of this

host in the Miami area, but thorough search on other representatives of this plant family, as well as on other plants, failed to reveal their presence.

Brief studies on migration of the larvae indicate some considerable movement during their development. Fifteen specimens of 3rd instar larvae were marked on the head capsule, using nail polish applied with a dissecting needle in recorded patterns of dashes and dots. These marked larvae were then released on the host plants at widely separated locations in the University planting. After one week, 13 of these 15 larvae were recovered. One had travelled a distance of 10 feet, three bushes away from the point of release. Three larvae had migrated to adjoining bushes in the row, and the other 9 larvae were recovered on the same plant where they were released.

Two species of parasitic Hymenoptera attack these caterpillars. The ichneumonid wasp *Trogomorpha trogiformis* (Cress.) was reported from this skipper by Butcher in 1951, as the first host record for any species of this parasitic genus. Additional specimens of this ichneumonid were reared from *Ephgriades b. floridensis* in September, 1953. Another first host record for a parasite was obtained during the course of the present studies, when a male and a female chalcid wasp emerged from two chrysalids of the skipper. These specimens have been identified by Dr. B. D. Burks of the U. S. National Museum as *Brachymeria slossonae* (Crawford), with the notation that they are the first reared specimens of the species and thus the first specimens from a known host. The chalcid consumes the entire contents of the chrysalid, and the chalcid pupa is formed within the empty skipper chrysalid. One of these chalcids emerged from the pupa of a skipper which had been collected in the field in the third larval instar and maintained in the laboratory in a glass cage thereafter. This caterpillar molted four days after it was collected, required 18 days in the 4th instar, and was in the pupal stage for 6 days before the parasite emerged. Hence, a minimum life cycle of approximately one month is indicated for this species of chalcid.

OTHER INSECTS ON BARBADOS CHERRY

During the course of these investigations, all other insects observed feeding on the barbados cherry were collected and recorded. Representatives of four other insect orders and one

plant-feeding arachnid were found and tentatively identified as follows [2]:—

ORDER ORTHOPTERA:

Family Locustidae—*Dichromorpha viridis* Scud. feeding on leaves.
Family Blattidae—two undetermined species feeding on fruit.
Family Tettigoniidae—*Amblycorypha uhleri* (Stal) and *Conocephalis fasciatus* DeG. feeding on leaves.

ORDER HEMIPTERA:

Family Coreidae—*Leptoglossus phyllopus* (Linn.), *Acanthocephala femorata* (Fab.) and *Euthochtha galeator* (Fab.) feeding on leaves.
Family Cydnidae—*Pangaeus bilineatus* (Say) feeding on leaves.
Family Pentatomidae—*Euschistus ursus* Van Duzee feeding on leaves.

ORDER HOMOPTERA:

Family Aleyrodidae—an undetermined whitefly found on young leaves.
Family Cercopidae—adults and nymphs of *Monecphora bicincta* (Say) found on many twigs and branches.
Family Cicadellidae—two undetermined species of leafhoppers feeding on leaves.
Family Cicadidae—one specimen of *Diceroprocta viridifascia* Walker apparently feeding on twigs.
Family Coccoidae—five species of scale insects were recorded from twigs and leaves. They are *Coccus hesperidum* (Linn.), *C. viridis* (Green), *Saissetia* sp., *Pulvinaria urbicola* Ckll., and *Icerya purchasi* Mask.
Family Fulgoridae—an undetermined species feeding on leaves.

ORDER COLEOPTERA:

Family Chrysomelidae—*Diabrotica balteata* Lec. feeding on leaves.
Family Curculionidae—*Pachneus opalis* Oliv. feeding on leaves.

ARACHNIDA, ORDER ACARINA:

Family Tuckerellidae—the distinctive mite *Tuckerella pavoniformis* (Ewing) found on bark of twigs.

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[2] The authors gratefully acknowledge generous assistance from Dr. F. H. Strohecker of the University of Miami in the identification of many of these insects, especially the Orthoptera, Hemiptera and Coleoptera.

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FRANKLINIELLA WELAKA, A NEW THRIPS FROM FLORIDA

J. DOUGLAS HOOD
Cornell University

The dark-colored, leisurely river now known as the St. Johns, along whose banks continually through two centuries fought Spanish and French and English and Americans and the militia of the brief-lived Republic of Florida, each opposed or aided by Indians of the Creek tribes, enlarges itself by tribute from innumerable, cattail-rimmed lakes and swamps and forms a pendant half the length of Florida. Its form led the Indians to call it the "Chain of Lakes", or Welaka—a name perpetuated in that of the small town near which the present species was taken.

Frankliniella welaka, sp. nov.
(Figs. 1 and 2)

Closely allied to *tenuicornis*, but differing most noticeably in the much smaller size, usually paler coloration, in the much shorter and far less slender antennal segments, and the position of the interocellar setae.

FEMALE (MACROPTEROUS).—Length about 1 mm. (distended, 1.3 mm). *Color* brown (more or less blackish), darkest in fore part of head and in the last few abdominal segments; all coxae brown, all trochanters and tarsi (save for the dark cups of latter) pale yellow; femora paler than body, yellow apically and basally, shading to brown between; tibiae largely yellow, clouded with brown on the morphologically upper surface; fore wings pale yellowish, usually perceptibly darker apically, but otherwise unmarked: antennae brown in segments I and II (the former slightly paler), III and IV whitish yellow but slightly darkened apically, IV also darkened in pedicel, V-VIII gray-brown, the first of these paler just beyond base, VI somewhat darker.

Head (Fig. 1) about *0.85* as long as width across eyes, which is conspicuously greater than that across cheeks, the latter *not noticeable serrated*, nearly straight, and tapering evenly to near base, where they roundly and abruptly converge; dorsal surface cross-striate in all except ocellar area, the striae on vertex interrupted; occipital apodeme dark brown and conspicuous, closely paralleling posterior margin of head; interocellar setae long (about 39 μ), dark brown, and conspicuous, *their bases only about 21 μ apart and on a line tangent with inner margins of median and posterior ocelli;* other setae short and inconspicuous. *Eyes* distinctly protruding, about 63 μ long dorsally, about 40 wide, and about 71 apart. *Ocelli* normal, their pigmentation red. *Mouth-cone* normal, extending about 77 μ beyond posterior dorsal margin of head. *Antennae* (Fig. 2) thoroughly normal, though *much shorter and relatively stouter* than in *tenuicornis* (Fig. 3).

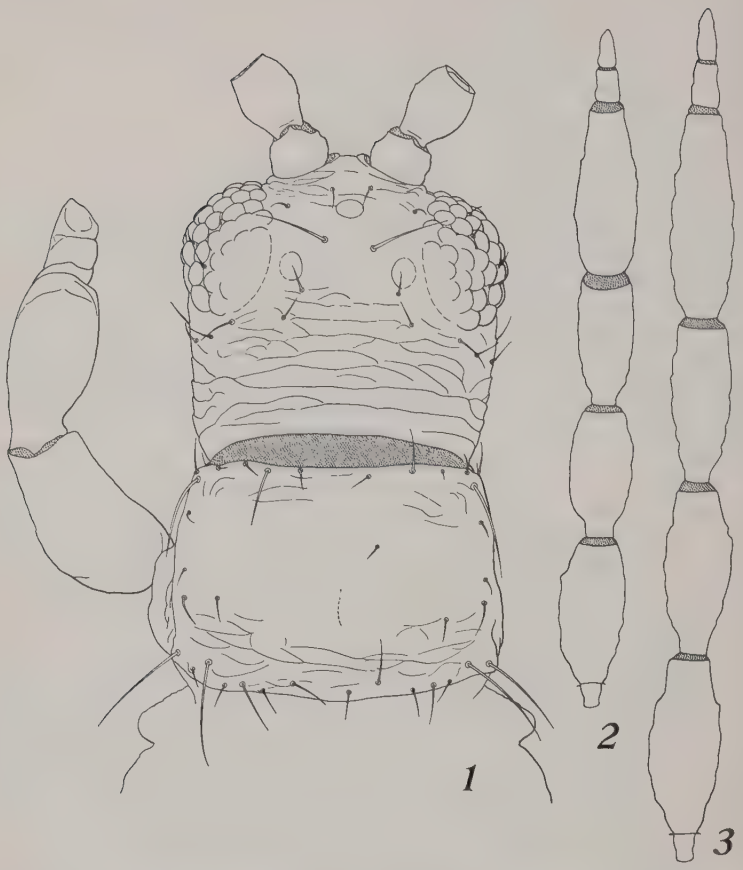

Fig. 1.—*Frankliniella welaka*, sp. nov., head and prothorax, ♀, holotype; x 227. (Setae omitted from leg and antennae.)[1]

Fig. 2.—*Frankliniella welaka*, outline of segments III-VIII of right antenna; x 363.

Fig. 3.—*Frankliniella tennicornis* (Uzel), outline of segments III-VIII of right antenna; x 363.

Prothorax (Fig. 1) normal, lightly sculptured (only a few of the darker and heavier striae shown in figure); major setae dark gray in fully-matured individuals, the antero-marginals about 28 μ, antero-angulars 51, epimerals (outer pair at posterior angles) 45, inner 55. *Pterothorax* normal

[1] The cost of the line engraving was borne by Cornell University through its committee on Faculty Research Grants.

in all respects; fore wings about 547 μ long, costa with about 1 + 18 setae (those at middle of wing about 44 μ), fore vein with 4 + 11-14, hind vein with 8-11.

Abdomen normal; setae on terminal segments dark brown, segment IX with I 80 μ, II 111, III 128, X with I 112, II 106.

Measurements of ♀ (holotype), in mm.: Length about 1.0 (distended, 1.26). Head, length 0.128, width across eyes 0.150, greatest width across cheeks 0.141, width at base 0.119. Prothorax, median length of pronotum 0.107, width (exclusive of coxae) 0.153. Mesothorax, width across anterior angles 0.178; metathorax, greatest width posteriorly 0.189. Abdomen, greatest width (at segment IV) 0.199.

Antennal segments:	I	II	III	IV	V	VI	VII	VIII
Length (μ):	23	36	41	35	34	48	9	12
Width (μ):	27	27	18	17	17	17	7	5

Total length of antenna, 0.238 mm.

MALE (MACROPTEROUS).—Length about 0.9 mm. (distended, 1.1 mm.). Color pale yellow in body, legs, and first four antennal segments, the remainder of antennae gray; segment II very slightly darker than I, as are also the tip of III, pedicel of IV, and varying amounts of the apical portion of the latter; V paler than VI-VIII, paler just beyond pedicel. Chaetotaxy and sculpture about as in female.

Measurements of ♂ (allotype), in mm.: Head, length 0.127, width across eyes 0.145, greatest width across cheeks 0.135, width at base 0.112. Eyes, dorsal length 0.063. Interocellar setae, length 0.043, interval 0.020. Mouthcone, length beyond posterior dorsal margin of head, 0.055. Prothorax, median length of pronotum 0.101, width (exclusive of coxae) 0.151; antero-marginal setae 0.025, antero-angular 0.044, outer pair at posterior angles 0.049, inner 0.055. Mesothorax, width across anterior angles 0.167. Metathorax, greatest width posteriorly 0.175. Fore wings, length 0.504. Abdomen, greatest width (at segment IV) 0.158.

Antennal segments:	I	II	III	IV	V	VI	VII	VIII
Length (μ):	20	35	43	34	33	45	8	12
Width (μ):	27	26	19	17	17	17	7	5

Total length of antenna, 0.230 mm.

FLORIDA: Welaka, July 10, 1954, J.D.H. and Minter J. Westfall, Jr., 18 ♀'s (including holotype) and 8 ♂'s (including allotype), from axils of cattails.

This little, dimorphically-colored species is one over which the writer has deliberated a great many years, and whose status even now seems a matter of some doubt. It is very closely related to *F. tenuicornis* (Uzel), originally described from Europe, but very common in eastern North America. That species, however—represented in my collection by Old World material from some six countries, and by American material from seven states and the District of Columbia—is apparently confined to members of the grass family and is roughly twice as large. The present species appears to be strictly American and to be restricted to cattails (*Typha*); but whether the difference in food is wholly or partially responsible for the difference in size and for the much less drawn-out antennae, would be a difficult question to answer. It is named now largely because an identification has been requested by correspondents.

Frankliniella tenuicornis (Uzel)
(Fig. 3)

This large species probably occurs throughout most of the Holarctic Realm. The following material has been studied:

CZECHOSLOVAKIA: BOHEMIA: 1♀ "cotype", from H. Uzel's collection, received from R. S. Bagnall.

CZECHOSLOVAKIA: SLOVAKIA: 2♀'s, det. by Jaroslav Pelikán.

HUNGARY: 1♀, det. by H. Priesner.

FINLAND: 1 ♀, det. by O. M. Reuter.

ENGLAND: 1 ♀, det. by R. S. Bagnal.

DENMARK: 6♀'s, coll. by Dr. J. Chester Bradley, at Dragϕr, Amager, Aug. 10, 1938, on grass along beach.

U. S. A.: Many ♀'s and and ♂'s, from Illinois, Indiana, Virginia, District of Columbia, Maryland, New Jersey, Massachusetts, and New York.

The following measurements are of four females, from four widely separated localities, and permit detailed comparison with the new species described above. The first measurement in each case is of a specimen from Denmark, while the next three measurements (if the condition of the specimens warrants their being taken), enclosed in parentheses, are, in order, those of (1) the Uzel "cotype", in italics, (2) a specimen from Slovakia, and (3) one from New York. Length about 1.4 mm. (*1.5*, 1.4, 1.3), distended 1.8 (*1.6*, 1.8, 1.7). Head, length 0.167 (——,

——, 0.160), width across eyes 0.176 (——, —— 0.185), greatest width across cheeks 0.163 (——, ——, 0.175), width at base 0.139 (——, ——, 0.150). Eyes, dorsal length 0.080 (*0.082*, ——, ——). Interocellar setae, length 0.050 (*0.049*, 0.051, 0.055), interval 0.042 (*0.040*, 0.042, 0.039). Pronotum, median length 0.141 (*0.157*, 0.144, 0.153), width (exclusive of coxae) 0.193 (*0.196*, ——, ——). Abdominal segment IX, seta I 0.146 (*0.150*, 0.142, 0.148), seta II 0.167 (*0.180*, 0.170, 0.163), seta III 0.168 (*0.170*, 0.177, 0.170); segment X, seta I 0.172 (*0.174*, 0.166, 0.169), seta II 0.157 (*0.167*, 0.148, 0.147).

Antennal segments:	I	II	III	IV	V	VI	VII	VIII	
Length (μ)	26	46	59	50	46	62	13	17	(♀, Denmark)
	....	....	....	*51*	*48*	*63*	....	....	(♀, cotype)
	....	....	....	55	48	63	13	17	(♀, Slovakia)
	30	47	64	50	49	64	12	16	(♀, New York)
Width (μ):	33-34	29	18	20	18	18	8	5	(♀, Denmark)
	36	31	20	20	18	19	8	6	(♀, New York)

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THE TAXONOMIC STATUS OF THE ARMYWORM PARASITE KNOWN AS ARCHYTAS PILIVENTRIS (VAN DER WULP) (DIPTERA: LARVAEVORIDAE)

CURTIS W. SABROSKY
Entomology Research Branch
Agricultural Research Service
United States Department of Agriculture

For many years, one of the most common and easily identified larvaevorid (tachinid) parasites of armyworms and other phalaenid larvae in southern United States and southward has been a large grayish-black species known as *Archytas piliventris* (Van der Wulp). Occasional records have appeared as *Pseudoarchytopsis piliventris* or, more recently, as *Archytas incerta* (Macquart). In the well-known genus *Archytas* Jaennicke, this species was readily recognized by the rather heavily grayish-pollinose abdomen and the parafacials covered with fine, whitish-yellow hairs. The former feature, in particular, made it possible to identify the species at a glance in a genus in which most species have the abdomen polished or with a fine indistinct "bloom."

Recently I noted some striking differences in the male genitalia between specimens from Argentina and from southern United States. Further study of the numerous specimens in the collection of the U. S. National Museum, from 24 countries ranging from the United States to Argentina and Chile, revealed that two closely related species with distinct geographical ranges have been considered as one species because of their similar habitus. The purpose of this paper is to clarify their identification, distribution, and nomenclature.

The material before me indicates the distinctness of the ranges of the two species, the one extending from southern United States to northern South America and southward down the west coast to northern Chile, and the other ranging in Argentina, Uruguay, Paraguay and southern Brazil. Unfortunately, lack of specimens from most of Brazil and Bolivia makes it impossible even to approximate the boundaries of the two in central South America, and to say whether or not they overlap.

In the early 1940's a few specimens of *"Archytas piliventris"* from Argentina and Uruguay were introduced into south-

ern United States as a parasite of the fall armyworm, *Laphygma frugiperda* (J. E. Smith). This brief effort was abandoned when it was pointed out that the species (as then identified!) already occurred here. It is not known whether *incertus* (= *piliventris*) became established from that one introduction of a limited amount of material.

At the present time I do not regard these and related species as distinct from typical *Archytas*. If or when they are recognized as forming a distinct genus or subgenus, *Pseudoarchytas* Townsend (1915) will take priority over *Pseudoarchytopsis* Townsend (1927). The generic name *Archytas* is masculine, and specific names are accordingly written to agree in gender. In the past, some authors have treated it as masculine, some as feminine, and some have been inconsistent in their usage.

Only the essential references and synonymy are listed below. Most of the published references to distribution and hosts can be assigned with assurance to *incertus* or to *marmoratus* on the basis of the known general distribution of the two. For a broad central area in South America, any published records will have to remain doubtful until verified by reexamination of specimens or more definite information on the ranges of the two in that region.

Archytas marmoratus (Townsend)

Pseudoarchytas marmorata Townsend, 1915, Insecutor Inscitiae Menstruus 2: 186 (Peru; holotype in U. S. National Museum).

Archytas (or *Pseudoarchytopsis*) *piliventris* (Vander Wulp) of authors, in part, for the area from southern United States to northern South America and along western South America to northern Chile.

DISTRIBUTION: Specimens examined from southern United States (S. C. to Fla. and west to Kans. and Tex.), Cuba, Jamaica, Haiti, Puerto Rico, Virgin Islands, Montserrat, Grenada, Trinidad, Surinam, Venezuela, Colombia, Mexico, Guatemala, El Salvador, Panama and the Canal Zone, Ecuador, Peru, Bolivia (Cavinas in Beni Department), and northern Chile (Camarones, Poconochile). Published records from Costa Rica and British Guiana are within this range and undoubtedly belong here.

Archytas incertus (Macquart)

Gonia incerta Macquart, 1851, Mém. Soc. Sci. Lille 1850: 152 (separate work: Diptères exotiques, Suppl. 4, pt. 2, p. 179) (Cited as "Du Brésil, Corrientes. M. d'Orbigny, Muséum," actually Corrientes Province, Argentina; holotype in Paris Museum).

Echinomyia piliventris Van der Wulp, 1883, Tijdschr. Ent. 26: 22 (Argentina; type presumed to be in Leiden Museum).

Pseudoarchytopsis brasiliensis Townsend, 1927 (?1926), Revista Mus. paulista 15(1): 252, 354 (Brazil; lectotype in U. S. National Museum). New synonymy.

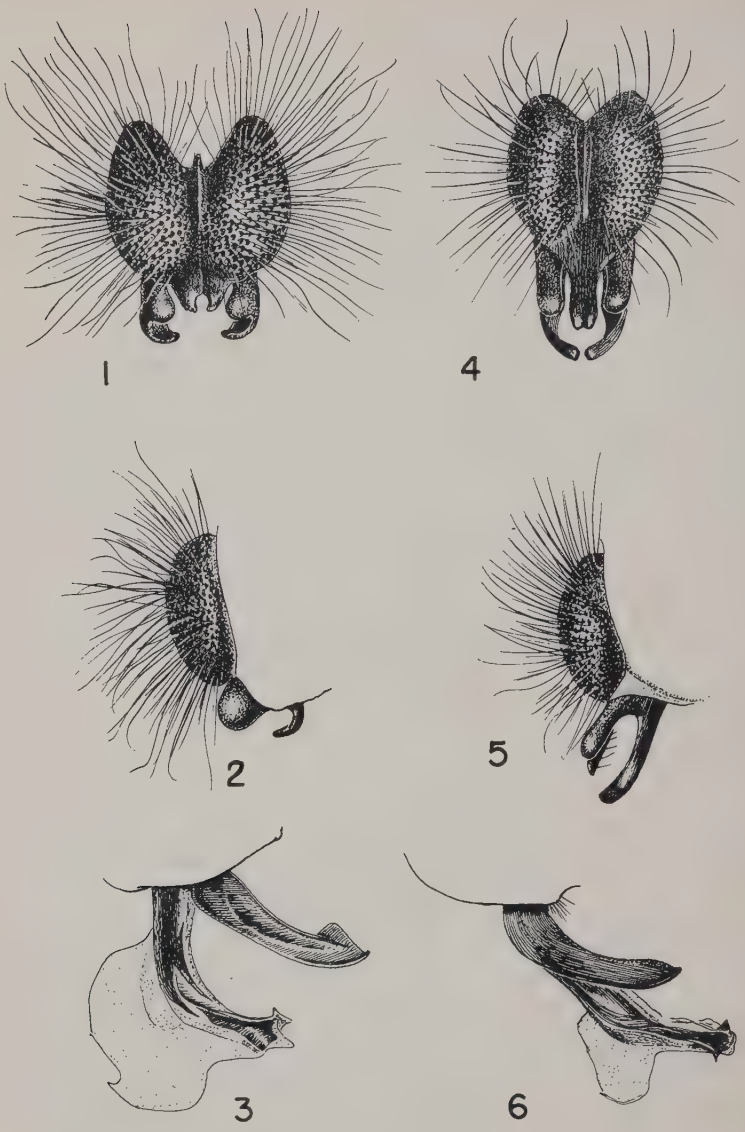
Archytas (or *Pseudoarchytas*) *piliventris* (Van der Wulp) of authors, in part, for the area of Argentina, Uruguay, Paraguay and temperate southern Brazil.

DISTRIBUTION: Argentina (northern: Buenos Aires, Corrientes, Tucumán, etc.), Uruguay, Paraguay (Caacupe), and southern Brazil (states of Sao Paulo and Minas Geraes).

Males of the two species can be distinguished easily by the characters of the genitalia (*marmoratus*, figs. 1-3; *incertus*, figs. 4-6). Frequently the distinct difference in the posterior (ventral) aspect can be seen without relaxation and dissection of the genitalia. I have been unable to find any reliable and useful external differences in either sex of the two species.

In an effort to find other characters, especially for the females, numerous measurements were made, for such commonly used ratios as height of cheek to height of eye, width of front at vertex to width of head, and lengths of second and third antennal segments. The range of variation in those ratios is great, and only slight differences between the species were found. It was also demonstrated that ratios will vary greatly according to the angle at which measures are taken, because of the strong convexity of front, eye, and cheek, the strong inclination of the cheek ventrad toward the midline and the impossibility of a clear focus simultaneously in profile on both ends of such a structure. For example, on the holotype of *marmoratus*, the cheek/eye ratio ranges from .45 to .71 depending on the angle from which heights are measured. The extremes are obviously based on measurements from extreme angles that would be avoided by the observer, but between these there is considerable room for difference in measurements, and hence in ratios derived from them. One can avoid such possible differences by shifting the specimen and measuring first the cheek and then the eye (or vice versa) at their maximum lengths. However, if measures are taken in that way, it should be so stated, lest a wrong impression be conveyed of the relative heights of cheek and eye as seen in profile.

In the material examined, the cheek/eye ratio was usually slightly less in *incertus* than in *marmoratus* when the head was



Figs. 1-3, *A. marmoratus;* figs. 4-6, *A. incertus.*[1]

Figs. 1 and 4, posterior aspect of inner (fused) and outer forceps; figs. 2 and 5, side view, the inner forceps usually more or less hidden; figs. 3 and 6, aedeagus (with thin, translucent, dorsal flange) and clasper (gonapophysis).

[1] Drawings by Arthur Cushman.

viewed in profile, but this difference almost disappeared when the maximum lengths of cheek and eye were used.

It may be noted that Townsend erected two supposed new genera for the species considered here, *Pseudoarchytas* for *marmoratus* Tns. and *Pseudoarchytopsis* for *brasiliensis* Tns. (cf. *incertus*). I do not regard these two nominal genera as distinct from each other, from comparison of their type species. The generic diagnoses given by Townsend are essentially the same, insofar as they can be compared directly for the female sex. In Townsend's key to genera (1936, Manual of Myiology, 3: 171), the two are distinguished as follows:

"Cheeks over ⅔ eye length, last section of C1 [= fifth vein] not ½ preceding, MM [= pair of median marginal bristles] on second segment in female ..... *Pseudoarchytas*

"Cheeks little over ½ eye length, last section of C1 at least nearly ½ preceding, no MM on second segment in female ..... *Pseudoarchytopsis*"

From actual measurements, the cheek/eye ratios based on the *maximum* possible lengths are .635 (holotype), .66 and .67 in the type series (all females) of *marmoratus*, and .61 and .63 in the allotype female of *brasiliensis* and a topotypic female determined by Townsend. Males have lightly lower cheek/eye ratios than females, and thus the holotype and paratype male of *brasiliensis* cannot be included in the comparison. As for the length of the sections of the fifth vein, the last section measures .48, .43, and .41 times the preceding section in the holotype and two paratypes of *marmoratus*, compared with ratios in *brasiliensis* of .52 in the holotype male, .48 in both allotype and male paratype, and .44 in the female determined by Townsend. Such similar and variable ratios, especially when studied in conjunction with series of each species, are neither generically nor specifically distinctive.

Likewise, there is no real difference in the presence or absence in the female sex of median marginal bristles (MM) on the second abdominal segment. In *brasiliensis*, neither the allotype female nor the Townsend-determined topotypic female has the bristles, whereas the holotype of *marmoratus* has a strong pair present. Each of the female paratypes of *marmoratus* has only a single bristle of the pair present. However, from the large series examined, it appears that in both species,

it is normal for females to lack these bristles. In 94 available females of *marmoratus*, 83 lacked the bristles, four had only one bristle of the pair present, either right or left one, and seven had a pair of bristles. In 45 females of *incertus* (= *brasiliensis*) from Argentina, 45 lacked the pair and two had one bristle only of the pair. In males of both species, the MM pair of bristles is regularly present on the second segment.

NOTES ON TYPE MATERIAL

Gonia incerta: The type female is said to be in poor condition. Dr. J. M. Aldrich examined it in 1929 and recorded in his notes that it is the same as *Archytas piliventris*. I am indebted to Monsieur E. Séguy of the Paris Museum for information that the "registre d'entrée" records the following for that specimen: "Séjour à Corrientes en 1827-1828 et retour à Buenos Ayres. Cette mouche paraît en décembre à Iribuena [sic!] sur les fleurs des Chardons et des Ombellifères. Le vol est direct et rapide." Monsieur Séguy informs me that the locality in the above record is clearly written "Iribuena," but this must certainly be a copyist's error, because the Hemiptera, Lepidoptera, and Hymenoptera from the same lot are recorded as from "Iribucua," and the latter (but no Iribuena!) is mentioned in d'Orbigny's volumes. With that information, and from study of the maps and detailed accounts of the travels in d'Orbigny's "Voyage dans l'Amerique Méridionale" (e.g., vol 3, part 2, Geographie), it is possible to locate the actual type locality as Iribucua in Argentina, province of Corrientes, nearly 100 kilometers east of the city of Corrientes (Iribú-cuá, on the American Geographic Society's Map of Hispanic America, SG 21).

Pseudoarchytopsis brasiliensis: Described from five males, one female, from two localities, without designated holotype. Townsend (1931, Revista de Ent. (Rio) 1: 158, and later and more specifically, 1939, Manual of Myiology 8: 58) stated that the holotype male and allotype female were from Itaquaquecetuba, Sao Paulo, Brazil, in the collection at Washington. That collection now contains two males and one female from Itaquaquecetuba, each with a red "Type" label used by Townsend, but without holotype or allotype labels, though the published statements can probably be accepted as a restriction as far as they go. Accordingly, the sole female is automatically the allo-

type, and the best male has been labeled lectotype and is so designated here.

Archytas pilifrons (Schiner)

Echinomyia pilifrons Schiner, 1868, Reise der Novara, p. 331 (Chile, holotype in Vienna Museum).

Jurinia nudigaena Brauer (ex Bigot), 1898, Sitzber. Kais. Akad. Wiss. Wien (Math.-nat. Classe) 107 (Abt. 1), Heft 6: 500. New synonymy.

This species is mentioned here in order to dispose of the nominal species *Jurinia nudigaena* Brauer. Apparently a manuscript name of Bigot's, it was validated by Brauer with a brief descriptive note, and cited as "Chili, Montevideo." Aldrich in 1929 saw the three specimens labeled types in the Bigot Collection (in collection of J. E. Collin, Newmarket, England), and stated in his notebook and card catalogue that "2 are *Archytas piliventris* V.d.W., the other is ♀ of *Archytas pilifrons* Sch." To fix the name definitely, I hereby restrict *nudigaena* to the specimen representing the species *Archytas pilifrons* (Schiner), as identified in the Bigot Collection by Dr. Aldrich.

A MESSAGE TO OUR FOREIGN READERS ABOUT INTERLINGUA ABSTRACTS

With the increasing need for better communication among scientists in all countries, an international language of science has been developed under the leadership of Dr. Alexander Gode. The language, known as Interlingua, is easily read by anyone with an elementary knowledge of Latin, Spanish or French.

It is anticipated that were there to be sufficient response to this message by our foreign readers, abstracts of each article would be published in Interlingua to accompany it. If you are interested in seeing such Interlingua abstracts published in the FLORIDA ENTOMOLOGIST, please notify Professor Lewis Berner, Editor, c/o Department of Biology, University of Florida, Gainesville, Florida, U. S. A.

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A NEW SPECIES OF CINARA FROM PENNSYLVANIA (HOMOPTERA: APHIDAE)

J. O. PEPPER [1] and A. N. TISSOT [2]

The authors acknowledge with thanks the assistance given by Dr. F. C. Hottes who examined specimens of this species and expressed the opinion that it is undescribed.

Cinara banksiana n. sp.

ALATE VIVIPAROUS FEMALE

Size and General Color.—All notes made from cleared and mounted specimens. Measurements given are based on ten or more individuals. The first figure is the average and the figures in parentheses show the range. Length from vertex to tip of anal plate 3.45 mm. (3.33-3.60). Thorax, head and antennal segments I and II dark brown. Basal half of segment III pale with apical half and segments IV, V and VI brown. The coxae, trochanters and femora of all legs dark brown, except sometimes the femora are lighter at the base. The prothoracic and metathoracic tibiae rather uniform dark brown. Mesothoracic tibia with dark brown basal area, followed by a short yellowish area which in turn shades into brown apically. All tarsi dark brown. Cornicles, cauda and anal plate dark brown. A transverse brown pigmented area anterior to the cauda is almost or wholly divided in many specimens. Another irregular, diffused, and sometimes divided pigmented area just anterior to the first mentioned one. Dorsum of abdomen with four longitudinal rows of small brown wax plates.

Head and Thorax.—Width across the eyes .67 mm. (.66-.70). Median suture of head very dark. Setae on the vertex and dorsum of thorax spinelike, tapering and about .07 mm. long. Ocular tubercles prominent. Antennal segments uneven in profile, diameter of III varying from .03 to .05 mm. in some individuals. Lengths of segments: III .59 mm. (.52-.62), IV .24 mm. (.21-.26), V .26 mm. (.24-.30), VI .16 mm. (.15-.18) including unguis which is .04 mm. long. Setae on antennal III spinelike and about .056 mm. long. Antennal setae inclined at an angle of about forty-five degrees. Segment III with four to nine (usually six) circular tuberculate sensoria, varying greatly in size and arranged in a single, somewhat irregular row, extending along the apical two-thirds of the segment. Segment IV with one or two sensoria, V with two. Third segment of rostrum .22 mm. in length, fourth segment .18 mm., fifth segment .09 mm. Fourth segment bearing four pairs of setae in addition to those at its apex. Media twice branched, the second branch closer to margin of wing than to first branch. Hind tibia 2.69 mm. (2.45-2.80) in length. First segment of hind tarsus .115 mm. long, second segment .28 mm., total length of tarsus .336 mm. Setae on hind tibia spinelike, tapering and sharp pointed, those on the outer margin in the middle portion of the segment about as long as the width of the tibia, those

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at the base somewhat shorter. All setae on hind tibia reclining, those on the apical portion forming more acute angles.

Abdomen.—Cornicle base somewhat irregular, with projections and indentations around the outer margin, average width .50 mm. Setae sparse and widely separated over most of the cornicle cone, much more numerous toward its apex. Setae sparse on dorsum of abdomen, more numerous on ventral surface. Length of setae on cornicle base and dorsum of abdomen about .06 mm. Transverse pigmented area anterior to cauda with sharp pointed setae arranged in a single interrupted row along the posterior margin of the area with about six setae on either side of the median break. Length of these setae about .10 mm. In the pigmented area anterior to the above, six setae about .07 mm. in length form a rather continuous row along the posterior margin of the area. Surface of the abdomen with fine reticulations and striations which generally are more evident in the region of the cornicles.

APTEROUS VIVIPAROUS FEMALE

Size and General Color.—All notes made from cleared and mounted specimens. Length from vertex to tip of anal plate 3.20 mm. (2.80-3.50). Thorax, head and first two antennal segments dark brown. Third antennal segment yellowish with short apical portion brown. Fourth segment dusky-brown with apical portion dark brown. Fifth and sixth segments dark brown, the fifth sometimes lighter basally. Median suture of head very dark. Segments three to five of the rostrum dark brown, the apical portion of segment two, light brown. Femora with a small basal area yellowish, shading quickly to dark brown. All coxae and trochanters dark brown. Prothoracic and metathoracic tibiae with a short area at the base blackish-brown, followed by a short yellowish-brown area which shades into dark brown apically. Mesothoracic tibia with a short blackish-brown base, followed abruptly by a light yellow area which shades gradually into the dark brown apical portion. All tarsi blackish-brown. Cornicles, cauda and anal plate dark brown. Dorsum of abdomen with large paired irregular, brown areas on anterior segments. Small irregular pigmented spots scattered elsewhere over the abdomen each bear a single seta. Two longitudinal rows of small brownish wax pore plates on each side of the abdomen. Anterior to the cauda is a usually divided pigmented band with several large setae on each side. Anterior to this band is another greatly diffused pigmented area with several shorter setae.

Head and Thorax.—Average width of head .71 mm. Antennal segments III to VI somewhat uneven in profile with the following lengths: III, .55 mm. (.48-.60), IV .22 mm. (.18-.24), V .26 mm. (.22-.29), VI .15 mm. including the unguis which is .042 mm. long. Third antennal segment with one or sometimes two sensoria, fourth with one and fifth with two sensoria. Setae on antennal III spinelike, strongly tapering and about as long as the width of the segment, inclined at an angle of about forty-five degrees. Ocular tubercles present. Setae on head and thorax spinelike, .05 to .06 mm. in length. Rostral segments with lengths as follows: III .20 mm., IV .17 mm., V .08 mm. Length of hind tibia 2.70 mm. (2.32-2.80). Setae on hind tibia numerous, spinelike, length equal to about one-half the width of tibia. Setae reclinate throughout the length of tibia but more so toward its apex.

Abdomen.—Cornicles large, volcano shaped, with somewhat irregular margins. Setae short and sparse over much of cornicle cone, much more numerous toward the apex. Setae on dorsum of abdomen spinelike, about .042 mm. long, many of them arising from small pigmented spots. Ventral surface of abdomen with more numerous setae which are a little longer and sharper pointed than those on the dorsum. Cauda and anal plate rounded, with many long setae. Surface of the abdomen reticulated as in the alate.

TYPES: All type specimens were collected in Pennsylvania on *Pinus Banksiana.* Holotype alate viviparous female and Morphotype apterous viviparous female (mounted on the same slide with one paratype alate viviparous female), Philipsburg (Black Moshanon Dam), June 13, 1948. Paratypes: 13 slides same locality and date as holotype and 14 slides same locality, June 20, 1954. The holotype, morphotype and four paratype specimens deposited in the United States National Museum, No. 62796; remaining paratype material in the collections of the writers and of F. C. Hottes. Type locality: Philipsburg (Black Moshanon Dam), Pennsylvania.

This species will not key out in Palmer's key to the genus *Cinara* in *Aphids of the Rocky Mountain Region* (1952) or in Hottes and Frison's (1931) key in *The Plant Lice, or Aphiidae, of Illinois.* With minor concessions it keys to *atlantica* (Wilson) in Wilson's (1923) key to the genus *Dilachnus,* Family Aphididae, in *Hemiptera of Connecticut.* We have not had authentic material of *atlantica* for comparison but Dr. Palmer (1945) gives measurements and figures based on her studies of a cotype slide of that species. The measurements agree fairly well with those of this species but the figures show clearly that the two insects are distinct. The setae on the appendages and cornicle of *atlantica* are shown to be fine while in this species they are heavy, spinelike and strongly tapering. The cornicle cone in *atlantica* has an even, regular margin and the setae are distributed evenly over its surface; in this species the margin of the cornicle cone is quite uneven with marked identations and the setae are sparse on most of the cone but numerous around the apex. In *atlantica* the fourth segment of the rostrum bears a single pair of setae in addition to those at its apex, while in this species the fourth segment bears four pairs of setae in addition to the apical ones.

Specimens taken on *Pinus Banksiana* at Philipsburg (Black Moshanon Dam), July 7, 1946 and July 4, 1947 may prove to be the same as the species described here but there is some question as to their identity so they are not considered in the description

or included in the type material. The apterous viviparous females agree fairly well but the alates in the two July collections are distinctly smaller and there appear to be constant differences in the sensoria on antennal segments III and IV, and possibly in other features also.

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NOTES

HOSTS OF TUCKERELLA PAVONIFORMIS (EWING) AND TUCKERELLA ORNATA (TUCKER) IN FLORIDA (ACARINA: TUCKERELLIDAE):—

The genus *Tuckerella* has but two known species, *pavoniformis* and *ornata*, both of which are bizarre in form. Baker and Pritchard (1953)[1] record *pavoniformis* only from Australia, Hawaii, and California and from a limited number of hosts, but during 1954 the writer found this species in the Miami area and on many hosts. The following list gives these hosts and for completeness includes the hosts and localities given by Baker and Pritchard. Their records are indicated by being enclosed in parentheses.

Apocynaceae:	Allamanda cathartica
Araceae:	Caladium bicolor
Araliaceae:	Polyscias Guilfoylei
Caricaceae:	(Carica Papaya; Hawaii)
Compositae:	Flaveria trinervia
Lauraceae:	Persea americana
Loganiaceae:	Buddleia madagascariensis
Malvaceae:	(Hisbiscus sp.; California, Hawaii)
	Hibiscus Rosa-sinensis
Meliaceae:	Swietenia Mahogani
	Khaya nyassica
Myrtaceae:	(Eucalyptus sp., Cypress pine; Australia)
	Psidium Guajava
Oleaceae:	(Privet; Hawaii, Australia)
	Jasminum Sambac, Ligustrum japonicum
Proteaceae:	Grevillea robusta
Rosaceae:	Licania rigida
Rutaceae:	(Citrus sp.; Australia)
Sapindaceae:	Litchi chinensis
Sapotaceae:	Achras zapota
Solanaceae:	Cestrum diurnum
	Solandra guttata
Verbenaceae:	Vitex trifolia

Tuckerella pavoniformis breeds chiefly on those parts of woody stems where most of the outer tissues have turned corky, but where areas of live tissue are still present. It has also been found breeding on the fruit of avocado and mahogany. The writer has never observed any stage on leaves.

Tuckerella ornata appears to be somewhat more restricted in its host range than *T. pavoniformis*. Below is a list of the hosts in the Miami area from which the writer has collected *T. ornata*. Included in the list and set off by parentheses are the records given by Baker and Pritchard for this species.

Anacardiaceae:	Schinus terebinthifolius
Apocynaceae:	Carissa grandiflora
Aquifoliaceae:	Ilex Cassine
Burseraceae:	Bursera Simaruba

[1] Baker, E. W., and A. E. Pritchard. 1953. The family categories of tetranychoid mites, with a review of the new families Linotetranidae and Tuckerellidae. Ent. Soc. Amer., Annals 46: 243-258.

Euphorbiaceae:	(Hevea sp.; Florida)
Guttiferae:	(Mammea americana; Guatemala)
Lauraceae:	Persea americana
Leguminosae:	(Bauhinia sp.; Florida)
	Tamarindus indica
Myrtaceae:	Psidium Guajava
Orchidaceae:	(Phalaenopsis sp.; Philippines)
Rutaceae:	Citrus mitis, Citrus maxima
Sapotaceae:	Achras zapota

The habits of *T. ornata* are similar to those of *T. pavoniformis.* On guava and sapote both species have been taken from the same twig. Although they may at times damage avocado fruit neither species appears to be of present economic importance.

Acknowledgment is made to Dr. E. W. Baker, Agricultural Research Service, U. S. Department of Agriculture who verified the identifications of the two species from guava, and to Professor R. O. Woodbury, University of Miami, for the identification of a number of the host plants.

DONALD DE LEON
Coral Gables, Florida

HELOCHARES SALLAEI IN THE EVERGLADES (COLEOPTERA: HYDROPHILIDAE):—

Helochares (*s. str.*) *sallaei* Sharp (=*Philhydrus estriatus* Blatchley) seems to be a very rare insect in collections. Until recently, it was apparently known from Florida only on the basis of Blatchley's types of *estriatus* from Dunedin (*Can. Ent.*, 49: 139, 1917). *H. sallaei* was originally based on a single specimen collected at Cordova, Mexico, by Sallé (Biologia Centrali-American, 1 (2) : 75,1882). The rarity of the species in Florida caused me to conclude that it was a waif introduced by shipping from Mexico (*Univ. Florida Biol. Sci. Ser.*, 5 (1) :31, 174, 1954).

To my chagrin, I now find that I have had at least seven specimens of *H. sallaei* in my collection for over a decade. They were recently discovered in a large jar of beetles and other insects taken in a light trap at Pahokee, Florida, on Jan. 20, 1941 (U. S. Department of Agriculture). The jar was given to me in 1942 by Dr. A. N. Tissot of the Florida Agricultural Experiment Station. The species will probably be found to be abundant in the Everglades when its habitat is discovered.

H. sallaei superficially resembles a large *Enochrus,* but can be distinguished by the non-laminate mesosternum, complete lack of sutural striae on the elytra, and by the very long maxillary palpi of which the pseudobasal segments are curved with the convexities toward the rear, the reverse of the condition in *Enochrus.* From the only other Floridian species of *Helochares, H.* (*Hydrobaticus*) *maculicollis* Mulsant, it is immediately distinguished by the darker color and complete lack of impressed striae on the elytra. The male genitalia of *sallaei* are remarkable in having the aedeagus deeply bifurcate and the parameres broadly overlapping at the base.

Specimens will be deposited in the University of Michigan Museum of Zoology, the Florida State Museum, the United States National Museum, and the American Museum of Natural History. Two cotypes of *estriatus* are now in the W. S. Blatchley Collection at Purdue University, Lafayette, Indiana.

FRANK N. YOUNG
Indiana University, Bloomington

NOTICE OF ANNUAL MEETING

The next annual meeting of the Florida Entomological Society will be held in Jacksonville on September 1 and 2 at the Roosevelt Hotel, 33 West Adams Street, Jacksonville. Mr. M. C. Van Horn, Florida Agricultural Supply, Jacksonville, is serving as Chairman of the Local Arrangements Committee. It is hoped that as many members as possible will attend these sessions.

THE SOUTHWESTERN RESEARCH STATION OF THE AMERICAN MUSEUM OF NATURAL HISTORY

The American Museum of Natural History has announced the establishment of The Southwestern Research Station. It is located on the eastern slope of the Chiricahua Mountains, near Portal, Cochise County, in southeastern Arizona. The property is within the limits of the Coronado National Forest at an elevtion of 5,400 feet.

The station was established for the purpose of making available research facilities for scientists and students in all branches of science, who have problems that can be investigated through the utilization of the faunal, floral and geological features of the area. It will be open during the entire year.

It is operated by the American Museum of Natural History, Central Park West at 79th Street, New York 24, New York and under the direction of Dr. Mont A. Cazier, Chairman and Curator of the Department of Insects and Spiders, to whom all inquiries should be addressed. Anyone interested in the station should write to the above named individual for the booklet which gives the details of the operation and a general description of the area.

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